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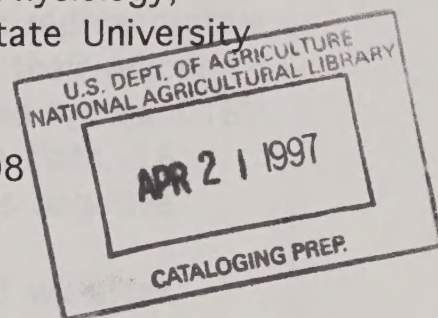
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EVALUATION OF CAPSICUM ACCESSIONS FOR RESISTANCE TO POTATO VIRUS Y, TOBACCO ETCH AND PEPPER MOTTLE VIRUSES AND THEIR POTENTIAL TO DIFFERENTIATE STRAINS OF THESE VIRUSES

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FINAL REPORT



The main objective of the proposal was to screen pepper genotypes against many isolates of three different viruses: tobacco etch virus (TEV), pepper mottle virus (PepMoV), and potato virus Y (PVY) that infect pepper. All experiments were conducted at Louisiana State University in Baton Rouge

Resistance of *Capsicum* spp. Genotypes to Tobacco Etch Potyvirus Isolates

Tobacco etch potyvirus is one of the most damaging viruses affecting peppers (*Capsicum* spp.) in the United States. Low disease incidence has been observed in TEV-resistant peppers. Availability of sources of resistance is necessary for breeders trying to produce cultivars which are both virus-resistant and horticulturally acceptable. The goal of this research was to evaluate the reactions of *Capsicum* genotypes and cultivars, shown previously to be resistant to one or more TEV isolates, to a range of TEV isolates from different locations.

MATERIALS AND METHODS

Thirty-six TEV isolates and 36 pepper genotypes were available for testing. In order to obtain maximum information from the isolates and genotypes without inoculating in all possible combinations, three consecutive experiments were carried out.

Experiment 1. Thirty-six field isolates of TEV from different geographic locations that had been identified by serology and host range were used. Ten isolates were from Louisiana, seven from the Dominican

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Republic, seven from Mexico, five from California, three from Florida, two from Honduras, one from Venezuela, and one from Colombia. Twelve pepper genotypes (Table 1), previously reported to be resistant to one or more isolates of TEV, plus Yolo Wonder as susceptible control, were selected to be evaluated for their response to inoculation by each of the 36 isolates. The purpose of Experiment 1 was to select representative or unusual virus isolates from the 36 total used, based on their reaction to the 13 pepper genotypes. Sixteen plants were inoculated for each TEV isolate-pepper line or cultivar combination. In separate flats, 16 noninoculated plants of each pepper were maintained as negative controls.

Symptom evaluation. Symptoms were evaluated 3 wk after inoculation. Presence of TEV in selected inoculated pepper genotypes with mild or no symptoms was tested for by direct double antibody sandwich ELISA, using commercial kits.

Experiment 2. Twenty-three pepper (Table 1) genotypes reported to be resistant to some potyvirus isolates were evaluated (along with Yolo Wonder as the susceptible control) for their reactions to 10 isolates of TEV selected from Experiment 1. Selected isolates and place of origin were TEV-401 (California), TEV-CAY-90 (Louisiana), TEV-MEX-21 (Mexico), TEV-C1 (Louisiana), TEV-TX-M (Mexico), TEV-VIL (California), TEV-DR93-28 (Dominican Republic), TEV-LMS-M (Mexico), TEV-H93-5 (Honduras), and TEV-V92-4 (Venezuela). Isolates were selected because they represented different levels or patterns of virulence or different geographic origins. Using these 10 isolates permitted comparison of the reactions of the 13 pepper genotypes of Experiment 1 with the reactions of the 24 pepper genotypes of Experiment 2. Therefore, Experiment 2 served to group similar pepper genotypes and identify unusual pepper genotypes from Experiments 1 and 2. Sixteen pepper plants from each genotype were mechanically inoculated with each isolate of TEV as described in Experiment 1. Test plants were evaluated 3 wk after inoculation for symptom development, as described previously. As in Experiment 1, selected symptomless, or mild-symptomed inoculated pepper genotypes were tested by ELISA.

Experiment 3. Ten pepper genotypes (Table 1) that showed potential as sources of resistance to TEV isolates were selected from Experiments 1 and 2. These genotypes all had resistance to a relatively large number of isolates in Experiment 1 or 2. Twelve pepper genotypes were

inoculated 3 wk after planting with the 10 TEV isolates used in Experiment 2. Tabasco and Yolo Wonder were used as susceptible controls. Test plants were evaluated for symptom expression 3 wk after inoculation.

RESULTS AND DISCUSSION

Experiment 1. The reactions of 13 pepper genotypes to 36 TEV isolates are shown in Table 2. Pepper genotypes Yolo Wonder (susceptible control) and Casca Dura were susceptible to all 36 TEV isolates. Yolo Y, a PVY-resistant genotype, was resistant (symptomless) to only one isolate. ELISA tests of Yolo Y plants inoculated with that isolate revealed the presence of TEV (data not shown). The Avelar genotype used was symptomless when inoculated with only eight of 36 isolates. It is possible that this particular accession of Avelar, obtained in 1975, is less resistant than other accessions. In Experiment 1, pepper genotypes PI 152225, Delray Bell, Greenleaf Tabasco, Agronomico 10C-5, and Tabasco-Type Mexico 88 were resistant to more than half of the TEV isolates tested.

Experiment 2. Reactions of 24 pepper genotypes to 10 TEV isolates are shown in Table 3. Peppers VR4 and Jaloro were resistant to nine of 10 TEV isolates. Pepper genotype LP-1 was resistant to eight of 10 isolates of TEV. Six of 24 tested pepper genotypes [Yolo Wonder (susceptible control), Casca Dura, ELS-2-1, S-20-1, Tam Veracruz, and Tam Mild Jalapeño] were susceptible to all 10 TEV isolates.

Experiment 3. Tabasco and Yolo Wonder (susceptible controls) were susceptible to all TEV isolates tested. In contrast, Jaloro, VR4, Delray Bell, and Agronomico 10C-5 were resistant to many TEV isolates tested. Table 4 shows the symptoms of five of the 10 TEV isolates inoculated to 12 pepper genotypes. These five isolates were chosen for Table 5 to illustrate the contrasts among some of the isolates used in Experiment 3. All five isolates of TEV induced wilting in Tabasco. Isolate 401 induced symptoms on all the pepper genotypes while V92-4 did not induce symptoms on eight of 12 pepper genotypes. Isolates LMS-M and H93-5 gave nearly opposite reactions in the resistant pepper genotypes of Experiment 3. LMS-M induced symptoms, generally severe, in all genotypes except Greenleaf Tabasco, PI 159236, and PI 152225. Isolate H93-5 induced symptoms in Greenleaf Tabasco, PI 159236, and PI 152225 but not in the other resistant genotypes. Isolate LMS-M was unable to overcome the C.

chinense resistance of PI 152225 and PI 159236, but caused symptoms, often severe, on the resistant *C. annuum* genotypes. Isolate H93-5 was unable to induce symptoms on the resistant *C. annuum* genotypes, but caused severe symptoms on *C. chinense* resistant genotypes.

Diversity of symptom severity was evident among the TEV isolates used. Examples representing extremes were isolates LMS-M and V92-4. Symptoms induced by LMS-M in most susceptible pepper genotypes included severe mosaic and leaf distortion. Isolate V92-4 induced mild symptoms on most of the pepper genotypes it infected.

In these experiments, some isolates from different geographic areas induced similar reactions. At the same time, some isolates from the same area had similar host ranges while others had dissimilar ones. It seems that the best approach for choosing germplasm sources that could be utilized for breeding for resistance to TEV isolates from different geographic areas is to use pepper genotypes resistant to the maximum number of isolates.

Some genotypes showed changes in apparent resistance between Experiment 1, Experiment 2, and/or Experiment 3. Possible explanations for these inconsistencies include seasonal temperature changes or seasonal light intensity/quality changes. Mechanical inoculations using sap extracts were highly successful in all experiments. Plants of susceptible control genotypes which escaped infection were rare. Therefore, differences between experiments in inoculation effectiveness are not a likely explanation for different results.

As would be expected, plants with symptoms were usually ELISA-positive, and most plants without symptoms were ELISA-negative. All TEV isolates used in these experiments were detectable by the commercial ELISA system utilized.

Cultivar Casca Dura Ikeda had similar reactions to the isolates as Magda. Likewise, Agronomico 10C-5 reacted similarly to Delray Bell. There were generally consistent trends with respect to resistance of pepper genotypes in the different experiments. Delray Bell, Agronomico 10C-5, VR4, Jaloro, and PI 152225 were among the pepper genotypes showing symptomless reactions to many of the isolates against which they were tested. These genotypes would appear to be good TEV resistance sources for pepper breeders looking for resistance useful in broad geographic areas.

Table 1. Identity and source of pepper genotypes used in Experiments 1, 2, and 3

Pepper genotype	<i>Capsicum</i> spp.	Seed source	Experiment
Yolo Wonder	<i>C. annuum</i>	PetoSeed Co.	1,2,3
Yolo Y	<i>C. annuum</i>	PetoSeed Co.	1
VR2	<i>C. annuum</i>	PetoSeed Co.	1,3
Agronomico 10C-5	<i>C. annuum</i>	PetoSeed Co.	1,3
ELS-2-1	<i>C. annuum</i>	PetoSeed Co.	2
Tam Veracruz	<i>C. annuum</i>	PetoSeed Co.	2
King Arthur	<i>C. annuum</i>	PetoSeed Co.	2
S-20-1	<i>C. annuum</i>	PetoSeed Co.	2
VR4	<i>C. annuum</i>	PetoSeed Co.	2,3
TSCH-2	<i>C. annuum</i>	PetoSeed Co.	2
FLBG-1	<i>C. annuum</i>	PetoSeed Co.	2
92LB44409	<i>C. annuum</i>	PetoSeed Co.	2
Delray Bell	<i>C. annuum</i>	A.A. Cook ^a	1,3
SC 46252	<i>C. annuum</i>	A.A. Cook	2
136AACook	<i>C. annuum</i>	A.A. Cook	1
Avelar	<i>C. annuum</i>	B. Villalon ^b	1
Tam Mild Jalapeño	<i>C. annuum</i>	B. Villalon	2
Hidalgo	<i>C. annuum</i>	B. Villalon	2
Rio Grande Gold	<i>C. annuum</i>	B. Villalon	2
Tambel 2	<i>C. annuum</i>	B. Villalon	2
Jaloro	<i>C. annuum</i>	B. Villalon	2,3
Casca Dura Ikeda	<i>C. annuum</i>	AVRDC ^c	2,3
C01664	<i>C. annuum</i>	AVRDC	2
Marquis	<i>C. annuum</i>	Rogers NK Seed Co.	2
Elisa	<i>C. annuum</i>	Rogers NK Seed Co.	2
Bomby	<i>C. annuum</i>	Rogers NK Seed Co.	2
Casca Dura (PI 342949)	<i>C. annuum</i>	Rogers NK Seed Co.	1,2
Reinger	<i>C. annuum</i>	Rogers NK Seed Co.	2
Magda	<i>C. annuum</i>	Rogers NK Seed	2,3
C00943 (selection)	<i>C. chinense</i>	AVRDC	1
PI 159236	<i>C. chinense</i>	A.A. Cook	1,3

PI 152225	<i>C. chinense</i>	A.A. Cook	1,3
Tabasco	<i>C. frutescens</i>	McIlhenny Co.	3
Greenleaf Tabasco	<i>C. frutescens</i>	McIlhenny Co.	1,3
Tabasco-Type Mexico 88	<i>C. frutescens</i>	McIlhenny Co.	1
LP-1	<i>C. frutescens</i>	L.L. Black ^d	2

^a University of Florida.

^b Texas A & M University.

^c Asian Vegetable Research and Development Center.

^d Louisiana State University.

Table 2. Number of tobacco etch potyvirus (TEV) isolates that did not induce symptoms in 13 pepper genotypes after mechanical inoculations in Experiment 1

Pepper genotype	TEV isolates/total isolates tested
Yolo Wonder	0/36 ^a
Casca Dura	0/36
Yolo Y	1/36
Avelar	8/36
136 A A Cook	10/36
C00943 (selection)	11/36
VR2	11/36
PI 159236	11/36
Tabasco-Type Mexico 88	21/36
Agronomico 10C-5	21/36
Greenleaf Tabasco	22/36
Delray Bell	23/36
PI 152225	24/36

^a Sixteen plants were inoculated for each virus isolate-pepper genotype combination. Symptoms were read 3 wk after inoculation.

Table 3. Number of tobacco etch potyvirus (TEV) isolates that did not induce symptoms in 24 pepper genotypes after mechanical inoculations in Experiment 2

Pepper genotype	TEV isolates/total isolates tested
Yolo Wonder	0/10 ^a
Casca Dura	0/10
ELS-2-1	0/10
Tam Veracruz	0/10
S-20-1	0/10
Tam Mild Jalapeño	0/10
C01664	1/10
SC 46252	3/10
92LB4449	3/10
TSCH-2	3/10
FLBG-1	3/10
Marquis	3/10
Elisa	3/10
King Arthur	3/10
Hidalgo	4/10
Bomby	4/10
Reinger	4/10
Rio Grande Gold	5/10
Magda	5/10
Tambel-2	5/10
Casca Dura Ikeda	6/10
LP-1	8/10
Jaloro	9/10
VR4	9/10

^a Sixteen plants were inoculated for each virus isolate-pepper genotype combination. Symptoms were read 3 wk after inoculation.

Table 4. Reactions of 12 pepper genotypes inoculated with five tobacco etch potyvirus (TEV) isolates tested in Experiment 3^a

Genotypes	TEV isolates				
	401	TX-M	LMS-M	H93-5	V92-4
Tabasco	W ^b	W	W	W	W
Yolo Wonder	SMD ^c	SM ^d	SMD	SMD	Me
PI 159236	SM	M	NS	SMD	MM ^f
Greenleaf Tabasco	M	M	NS ^g	SMD	M
Magda	M	M	SMD	NS	NS
Casca Dura Ikeda	M	MM	SMD	NS	NS
VR2	SM	M	SMD	NS	NS
Jaloro	MM	MM	SM	NS	NS
PI 152225	M	M	NS	SM	NS
VR4	M	NS	SMD	NS	NS
Agronomico10C-5	M	NS	M	NS	NS
Delray Bell	M	NS	M	NS	NS

^a Sixteen plants were inoculated for each virus isolate-pepper genotype combination. Symptoms were read 3 wk after inoculation.

^b W=Wilt.

^c SMD=Severe mosaic and leaf distortion.

^d SM=Severe mosaic.

^e M=Mosaic.

^f MM=Mild mosaic.

^g NS=No symptoms.

Resistance of *Capsicum* spp. Genotypes to Pepper Mottle Potyvirus Isolates

Pepper mottle virus (PepMoV) was first identified from pepper (*Capsicum* spp.) in Florida and Arizona in 1972. It causes pepper yield reductions in southern parts of the United States and in Mexico and Central America. At the present time, the most effective way to control PepMoV is through host resistance. Resistance in *Capsicum* spp. to PepMoV is often genetically linked with resistance to two other potato virus Y group members, TEV and PVY. The purpose of this study was to determine the reactions of pepper genotypes with reported PepMoV resistance when challenged with a range of PepMoV isolates from different countries in the Western Hemisphere. In addition, selected *Capsicum* genotypes with reported resistance to TEV and/or PVY were challenged with the PepMoV isolates.

MATERIALS AND METHODS

Experiment 1. Eighteen isolates of PepMoV that had been identified by serology and host range were used. The number of isolates from each location were as follows: Colombia 3, Ecuador 1, Honduras 5, Mexico 1, Nicaragua 5, United States 2, Venezuela 1. Ten pepper genotypes with reported potyvirus resistance, plus two susceptible controls, Yolo Wonder and Tabasco, were selected to evaluate differences between the 18 isolates. Inoculum sources consisted of infected plants of NC95 tobacco or susceptible pepper genotypes (Yolo Wonder or Tabasco). Inoculum was prepared by grinding infected leaf tissue in cold 0.025 M potassium phosphate buffer, pH 7.1, with cold sterilized mortars and pestles. Eight plants were inoculated for each PepMoV isolate-pepper line combination. In separate flats eight uninoculated plants of each pepper line were kept as negative controls.

Symptom evaluation. Symptoms were evaluated about 3 wk after inoculation. Presence of PepMoV in selected inoculated pepper genotypes with mild or no symptoms was tested for by indirect ELISA using a direct antigen coating method. Additional testing of isolates for verification of PepMoV identity was conducted using commercial direct double antibody sandwich ELISA kits for TEV and PVY.

Experiment 2. Thirty pepper genotypes reported to be resistant to some potyvirus isolates were evaluated for their reactions to eight

PepMoV isolates selected from Experiment 1. Selected isolates were C93-3 (Colombia), H92-35 and H92-32 (Honduras), N92-2 and N92-5 (Nicaragua), V92-3 (Venezuela), Tex82-1 (USA), and E94-C (Ecuador). Isolates were selected because they represented different patterns and/or levels of virulence, and different geographic origins. Eight pepper plants from each line were mechanically inoculated with each PepMoV isolate as in Experiment 1. Genotypes were evaluated about 3 wk after inoculation for symptom development as described above. As in Experiment 1, selected inoculated pepper genotypes with mild or no symptoms were tested by indirect ELISA.

Experiment 3. Sixteen pepper genotypes were inoculated with the eight PepMoV isolates listed previously. Twelve of the 16 genotypes (LP-1, PI 152225, IAC Ubatuba Cambuci, Delray Bell, Agronomico 10C5, VR-4, Jaloro, Greenleaf Tabasco, Tabasco-Type Mexico 88, PI 159236, Magda, and Avelar) were chosen as among the more resistant genotypes in Experiments 1 and 2. Yolo Y and VR-2 were chosen due to their usefulness in distinguishing several of the isolates. Yolo Wonder and Tabasco were susceptible controls. Symptom and ELISA evaluations were conducted as in Experiments 1 and 2.

RESULTS AND DISCUSSION

Experiment 1. Pepper genotypes tested varied greatly in their reactions to the PepMoV isolates. These included no symptoms, systemic foliar mosaic, and reactions in which symptoms were visible in lower leaves only (Table 1).

Plants in the "no symptoms" category and plants in the "foliar mosaic in lower leaves only" category were combined to form a total "restricted symptom development" category in Table 1. With all 18 isolates used in Experiment 1, Delray Bell, IAC Ubatuba Cambuci (*C. baccatum*), and PI 152225 (*C. chinense*) were able to restrict symptom development (Table 1), although none of the three genotypes were symptomless to all isolates. Jaloro, PI 159236 (*C. chinense*), and Avelar restricted symptom development of 16 of the 18 isolates. All other genotypes showed lower levels of resistance. Yolo Y was symptomless when inoculated with three isolates (Table 1), two of which, C93-3 and H92-32, were selected along with six other isolates for use in Experiments 2 and 3. ELISA testing of Yolo Y plants inoculated with C93-3 and H92-32 was negative (data not shown).

Experiment 2. Thirty-one pepper genotypes (thirty test genotypes plus susceptible control Yolo Wonder) were inoculated with the eight isolates in Experiment 2 (Table 2). The *C. frutescens* line LP-1 and *C. chinense* PI 152225 restricted symptom development of all eight isolates; Jaloro, Delray Bell, and VR-4 restricted symptom development of seven out of eight isolates; IAC Ubatuba Cambuci and Agronomico 10C5 restricted symptom development of six out of eight isolates (Table 2). The remaining 23 test genotypes restricted symptom development of five or fewer isolates. Yolo Y was symptomless to two PepMoV isolates (Table 2). These isolates were C93-3 and H92-32 (data not shown).

Experiment 3. Among the 16 pepper genotypes inoculated, LP-1, Delray Bell, Agronomico 10C5, and VR-4 showed restricted symptom development with seven of eight isolates, and PI 152225, IAC Ubatuba Cambuci, Jaloro, and PI 159236 with six isolates (Table 3). The remaining genotypes showed restricted symptom development with five or fewer isolates. Yolo Y restricted symptom development of two isolates (Table 3). These isolates were C93-3 and H92-32 (Table 4). ELISA testing of symptomless Yolo Y plants inoculated with these two isolates was negative (data not shown).

C93-3 and H92-32 induced symptoms in few resistant genotypes. However, these two isolates were ELISA-negative when tested with potato virus Y antisera using commercial kits (data not shown). Paradoxically, isolate C93-3 induced symptoms in LP-1, one of the more resistant genotypes (Table 4).

Isolates N92-2 and N92-5 were each able to induce symptoms in many of the resistant genotypes. However, N92-2 was able to induce symptoms in the *C. chinense* lines PI 152225 and PI 159236, *C. frutescens* cv. Greenleaf Tabasco (with potyvirus resistance derived from PI 152225 and PI 159236) and in line Tabasco-Type Mexico 88 (Table 4). In contrast, N92-5 was unable to induce symptoms in the above *C. chinense* and *C. frutescens* genotypes, but induced systemic symptoms in the *C. annuum* genotypes Avelar, Magda, VR-4, Agronomico 10C5, and Delray Bell in which N92-2 was less aggressive (Table 4). Similar results were obtained for the two isolates in Experiment 2.

Isolate E94-C had the broadest pattern of virulence of the eight isolates, inducing systemic symptoms or symptoms in lower leaves of all test genotypes except LP-1 (Table 4).

The pepper genotypes LP-1, Delray Bell, Agronomico 10C5, VR-4, PI

152225, and Jaloro, which restricted symptom development of many PepMoV isolates in this research, were also shown to be resistant to many isolates of TEV in previous experiments. The genotypes would therefore appear to be good sources of resistance to both viruses. The *C. baccatum* cv. IAC Ubatuba Cambuci, which performed well in PepMoV screening, has been found in prior research in this laboratory to be highly susceptible to TEV isolates. If this line were used in breeding programs as a source of resistance to PepMoV, a separate source of TEV resistance would be required.

Table 1. Reactions of 12 pepper genotypes to 18 pepper mottle virus isolates in Experiment 1

Pepper Genotype	Number of virus isolates which induced:			
	Systemic foliar mosaic	No symptoms	Foliar mosaic in lower leaves only	Restricted symptom ^a development
Delray Bell	0	15	3	18
IAC Ubatuba Cambuci	0	14	4	18
PI 152225	0	14	4	18
Jaloro	2	16	0	16
PI 159236	2	15	1	16
Avelar	2	12	4	16
Greenleaf Tabasco	5	13	0	13
Durkee Cayenne #9045	6	8	4	12
VR-2	10	6	2	8
Yolo Y	15	3	0	3
Yolo Wonder	18	0	0	0
Tabasco	18	0	0	0

^a Total number of isolates from the "no symptoms" and "foliar mosaic in lower leaves only" categories.

Pepper Genotype	Number of virus isolates which induced:			
	Systemic foliar mosaic	No symptoms	Foliar mosaic in lower leaves only	Restricted symptom ^a development
LP-1	0	8	0	8
PI 152225	0	6	2	8
Jaloro	1	6	1	7
Delray Bell	1	5	2	7
VR-4	1	5	2	7
IAC Ubatuba Cambuci	2	6	0	6
Agronomico 10C5	2	5	1	6
Greenleaf Tabasco	3	5	0	5
Tabasco-Type Mexico 88	3	5	0	5
Agronomico 10	3	5	0	5
Magda	3	5	0	5
PI 264281	3	4	1	5
King Arthur	3	4	1	5
Tambel 2	3	4	1	5
PI 159236	4	4	0	4
Tam Veracruz	4	4	0	4
AMA 12	4	4	0	4
Ikeda	4	4	0	4
Avelar	4	4	0	4
C00943 (sel'n)	4	4	0	4
FLBG-1	4	4	0	4
VR-2	4	3	1	4
Elisa	4	3	1	4
TSCH-2	4	3	1	4
Marquis	4	2	2	4
Bomby	5	3	0	3
Reinger	5	2	1	3
C 01644	5	2	1	3
Yolo Y	6	2	0	2
ELS 2-1	7	1	0	1
Yolo Wonder	8	0	0	0

^aTotal number of isolates from the "no symptoms" and "foliar mosaic in lower leaves only" categories.

Pepper Genotype	Number of virus isolates which induced:			
	Systemic foliar mosaic	No symptoms	Foliar mosaic in lower leaves only	Restricted symptom ^a development
LP-1	1	7	0	7
Delray Bell	1	5	2	7
Agronomico 10C5	1	5	2	7
WR-4	1	5	2	7
PI 152225	2	6	0	6
MAC Ubatuba Cambuci	2	6	0	6
Maloro	2	5	1	6
PI 159236	2	4	2	6
Greenleaf Tabasco	3	5	0	5
Tabasco-Type Mexico 88	3	5	0	5
Magda	3	5	0	5
Avelar	4	2	2	4
WR-2	5	3	0	3
Yolo Y	6	2	0	2
Yolo Wonder	8	0	0	0
Tabasco	8	0	0	0

^aTotal number of isolates from the "no symptoms" and "foliar mosaic in lower leaves only" categories.

Table 4. Foliar symptoms induced by eight pepper mottle virus isolates in 16 pepper genotypes in Experiment 3

Pepper Lines	Virus Isolates and Symptoms ^a							
	C93-3	II92-35	II92-32	N92-2	N92-5	V92-3	Tex82-1	E94-C
LP-1	M	NS	NS	NS	NS	NS	NS	NS
Delray Bell	NS	NS	NS	NS/M	M	NS	NS	NS/M
Agronomico 10C5	NS	NS	NS	NS/M	M	NS	NS	NS/M
VR-4	NS	NS	NS	NS/M	M	NS	NS	NS/M
PI 152225	NS	NS	NS	M	NS	NS	NS	M
IAC Ubatuba Cambuci	NS	NS	NS	NS	M	NS	NS	M
Jaloro	NS	NS	NS	ST,M	M	NS	NS	NS/M
PI 159236	NS	NS/M	NS	M	NS	NS/M	NS	SM,M
Greenleaf Tabasco	NS	NS	NS	ST,M	NS	M	NS	ST,M
Tabasco-Type Mexico 88	NS	NS	NS	ST,M	NS	M	NS	ST,M
Magda	NS	M	NS	NS	M	NS	NS	SM,SMD
Avelar	NS	SM	NS/M	NS/M	M	NS	M	M,SM
VR-2	NS	NS	NS	M	SMD	M	M	M
Yolo Y	NS	SMD	NS	M	SMD	SMD	SMD	SMD
Yolo Wonder	SMD	SMD	SM	SM	SMD	SMD	SMD	SMD
Tabasco	ST	M,ST	M,ST	M,ST	M,ST	M,ST	SN	ST,SN

^a M=mosaic, NS=no symptoms, NS/M=no symptoms upper leaves, mosaic lower leaves, SM=severe mosaic, SMD=severe mosaic and leaf distortion, ST=stunt, SN=systemic necrosis.

Resistance of *Capsicum* spp. Genotypes to Potato Virus Y Potyvirus Isolates

PVY is the most common potyvirus affecting pepper worldwide. Disease incidence may reach 100% in some areas, resulting in significant yield loss. Several strains of PVY have been reported, but the occurrence and distribution of them in the U.S. is not known. Since resistance in *Capsicum* to TEV, PepMoV, and PVY appears to be closely linked, pepper genotypes that showed high levels of resistance to TEV and PepMoV were tested in this study.

MATERIALS AND METHODS

Procedures utilized for the screening of pepper genotypes to PVY were the same procedures used with PepMoV. However, the information on potyvirus resistance obtained in the two previous experiments allowed us to perform the screening of PVY using only two phases. The only limiting aspect of the experiments with PVY was the lack of a larger number of virus isolates.

RESULTS AND DISCUSSION

Pepper genotypes that showed resistance to PepMoV and TEV were also resistant to PVY (Tables 1 and 2). This was not surprising since resistance to these potyviruses is closely linked.

Pepper genotypes PI 12225, LP-1, Delray Bell, Jaloro, and Magda appear to be good sources of resistance for PVY. Other genotypes that showed resistance were: Casca Dura, Avelar, Tab-Mex 88, TF 38A, Monk's Hat, and Greenleaf Tabasco.

Table 1. Foliar symptoms induced by sixteen Potato Virus Y isolates in eight pepper genotypes.

Virus Isolates	Pepper Genotypes and Symptoms ^a							
	YW	YY	VR-2	PI 12225	LP-1	Delray Bell	Jaloro	Magda
B-1	m	ns	ns	ns	ns	ns	ns	ns
B-2	m	ns	ns	ns	ns	ns	ns	ns
B-3	m	ns	ns	ns	ns	ns	ns	ns
B-4	m	ns	ns	ns	ns	ns	ns	ns
B-9	m	ns	ns	ns	ns	ns	ns	ns
DR92-1	m	ns	ns	ns	ns	ns	ns	ns
DR92-3	m	ns	ns	ns	ns	ns	ns	ns
DR92-8	sm/st	sm	sm	ns	ns	ns	ns	ns
DR92-9	m	ns	ns	ns	ns	ns	ns	ns
DR93-21	m	m	m	ns	ns	ns	ns	ns
DR93-24	sm/st	m/st	m/st	ns	ns	ns	ns	ns
DR93-26	m	ns	ns	ns	ns	ns	ns	ns
DR93-27	mm	ns	ns	ns	ns	ns	ns	ns
Calif.-111.2	m	ns	ns	ns	ns	ns	ns	ns
Al89-2	m	ns	ns	ns	ns	ns	ns	ns
T ₂ Al90-3	m	ns	ns	ns	ns	ns	ns	ns

^am=mosaic, mm=mild mosaic, sm=severe mosaic, st=stunt, ns=no symptoms

Table 2. Foliar symptoms induced by six Potato Virus Y isolates on sixteen pepper genotypes.

Pepper Genotypes	Virus Isolates and Symptoms ^a					
	B-2	DR92-3	DR92-8	DR92-9	DR92-26	Calif.-111.2
YW	m	m	m	m	m	mm
YY	ns	ns	m	mm	ns	ns
VR-2	ns	ns	m	ns	ns	ns
PI 152225	ns	ns	ns	ns	ns	ns
LP-1	ns	ns	ns	ns	ns	ns
Delray Bell	ns	ns	ns	ns	ns	ns
Jaloro	ns	ns	ns	ns	ns	ns
Magda	ns	ns	ns	ns	ns	ns
Avelar	ns	sn	ns	ns	ns	ns
Casca Dura	ns	ns	ns	ns	ns	ns
Tab- Mex 88	ns	ns	ns	ns	ns	ns
TF 38A	ns	ns	ns	ns	ns	ns
Monk's Hat	ns	ns	ns	ns	ns	ns
GLT	ns	ns	ns	ns	ns	ns
Tab	m	mm	sm	sm	ns	mm
Thai Cluster	m	mm	ns	m	ns	ns

^am=mosaic, mm=mild mosaic, sm=severe mosaic, sn=systemic necrosis, ns=no symptoms

PUBLICATIONS

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